This listing of claims will replace all prior versions of the claims in the application:

Listing Of Claims

1. (Currently amended) A method of determining a control input signal, comprising:

determining a jerk parameter equation, the jerk parameter equation being

$$\sum_{i=0}^{N}(-1)^{i+1}T_i=\frac{1}{J}$$

determining a first constraint equation, the first constraint equation being

$$\sum_{i=0}^{N}(-1)^{i}\exp(-\sigma_k T_i)\cos(\omega_k T_i)=0\ for\ k=1,2,3,\ldots$$

determining a second constraint equation, the second constraint equation being

$$\sum_{i=0}^{N}(-1)^{i}\exp(-\sigma_k T_i)\sin(\omega_k T_i)=0\ for\ k=1,2,3,\ldots$$

determining a set of T_i values that provides a solution for each of (a) the jerk parameter equation, (b) the first constraint equation and (c) the second constraint equation;

selecting the set of T_i values to provide a selected set;

using the selected set to determine a corresponding transfer function according to the following equation;

$$G(s)=\sum_{i=0}^{N}(-1)^{i}\exp(-sT_i)$$

coupling the transfer function with a filter <u>function</u> to provide an augmented transfer function; and

acting upon an input signal according to the augmented transfer function to provide a control input signal,

wherein N is an odd integer, J is the jerk parameter, σ_k is the real part of the k^{th} underdamped pole, and ω is the k^{th} natural frequency of a system being controlled.

2. (Original) The method of claim 1, wherein the transfer function includes a pulse, and an amplitude of the pulse is selected to achieve a desired change in the system upon completion of the control input signal.

3. (Original) The method of claim 1, wherein selecting the set of T_i values to provide a selected set is accomplished by:

determining a total time parameter for the selected set, the total time parameter being equal to an amount of time needed to execute the corresponding transfer function; and

comparing the total time parameter of the selected set to determine that the selected set has a smallest total time parameter.

4. (Original) The method of claim 1, wherein the set of T_i values provides a solution to a desensitizing equation, in addition to the jerk parameter equation, the first constraint equation and the second constraint equation.

5. (Original) The method of claim 4, wherein the desensitizing equation is:

$$\sum_{i=0}^{N}(-1)^i T_i \exp(-\sigma_k T_i)\sin(\omega_k T_i) = 0 \ for\ k = 1,2,3...$$

and the set of T_i values provides a solution to a further desensitizing equation, the further desensitizing equation being

$$\sum_{i=0}^{N}(-1)^i T_i \exp(-\sigma_k T_i)\cos(\omega_k T_i) = 0 \ for\ k = 1,2,3...$$

6. (Original) The method of claim 1, wherein the filter is an integrator.

7. (Original) The method of claim 1, wherein the filter is a first order filter.

8. (Original) The method of claim 1, wherein the filter is a sinusoidal filter.

9. (Currently amended) A method of determining a control input signal, comprising:

selecting a desired time delay;

determining a jerk parameter equation, the jerk parameter equation being

$$2A_1nT_s + 2A_2mT_s + A_3nT_s = \frac{1}{J}$$

determining a first constraint equation, the first constraint equation being

$$A_1 - (A_1 - A_2)\cos(nT_s\omega) - (A_2 - A_3)\cos((n+p)T_s\omega) - (A_3 - A_2)\cos((n+p+m)T_s\omega) - (A_2 - A_1)\cos((n+2p+m)T_s\omega) - A_1\cos((2n+2p+m)T_s\omega) = 0$$

determining a second constraint equation, the second constraint equation being

$$-(A_1 - A_2)\sin(nT_s\omega) - (A_2 - A_3)\sin((n+p)T_s\omega) - (A_3 - A_2)\sin((n+p+m)T_s\omega) - (A_2 - A_1)\sin((n+2p+m)T_s\omega) - A_1\sin((2n+2p+m)T_s\omega) = 0$$

determining a set that satisfies (a) the jerk parameter equation, (b) the first constraint equation and (c) the second constraint equation, each set comprising a value for each of A1, A2, A3, m, n and p;

selecting the set to provide a selected set;

using the selected set to determine a corresponding transfer function according to the following equation

$$G(s) = A_1 - A_1 e^{-snT_s} + A_2 e^{-snT_s} - A_2 e^{-s(n+p)T_s} + A_3 e^{-s(n+p)T_s} - A_3 e^{-s(n+p+m)T_s} +$$
$$A_2 e^{-s(n+p+m)T_s} - A_2 e^{-s(n+2p+m)T_s} + A_1 e^{-s(n+2p+m)T_s} - A_1 e^{-s(2n+2p+m)T_s}$$

coupling the transfer function with a filter <u>function</u> to provide an augmented transfer function; and

acting upon an input signal according to the augmented transfer function to provide a control input signal,
<u>wherein J is the jerk parameter, σ_k is the real part of the k^{th} underdamped pole, and ω is the k^{th} natural frequency of a system being controlled</u>.

10. (Original) The method of claim 9, wherein selecting the set to provide a selected set is accomplished by:

determining a total time parameter for the selected set, the total time parameter corresponding to an amount of time needed to execute the corresponding transfer function; and

comparing the total time parameter of the selected set to determine that the selected set has a smallest total time parameter.

11. (Original) The method of claim 9, wherein selecting the set to provide a selected set is accomplished by:

determining a sensitivity factor for the selected set, the sensitivity factor being determined by:

$$f=\sum_{\omega=\omega_l}^{\omega=\omega_h} abs\begin{pmatrix} A_1\left(1-\exp(-nT_s j\omega)\right)+A_2\exp(-(n+p)T_s j\omega)(1-\exp(-mT_s j\omega))+ \\ A_3\exp(-(n+2p+m)T_s j\omega)(1-\exp(-nT_s j\omega)) \end{pmatrix}$$

comparing the sensitivity factor of the selected set to determine that the selected set has a smallest sensitivity factor.

12. (Original) The method of claim 9, wherein the filter is an integrator.

13. (Original) The method of claim 9, wherein the filter is a first order filter.

14. (Original) The method of claim 9, wherein the filter is a sinusoidal filter.

15. (Currently amended) A method of generating an input to a system, comprising:

determining a jerk parameter equation, the jerk parameter equation describing the rate of change of the acceleration of a component of the system from a first state to a second state;

determining a first constraint equation and a second constraint equation, the constraint equations describing how poles of the jerk parameter equation may be canceled;

determining a set of amplitudes (A1, A2, A3) and time scaling factors (n, p, m) that provides a solution for each of (a) the jerk parameter equation, (b) the first constraint equation and (c) the second constraint equation;

selecting the set of amplitudes and time scaling factors to provide a selected set;

using the selected set to determine a corresponding transfer function according to the following equation

$$G(s)=A_1-A_1e^{-snT_s}+A_2e^{-snT_s}-A_2e^{-s(n+p)T_s}+A_3e^{-s(n+p)T_s}-A_3e^{-s(n+p+m)T_s}+ \\ A_2e^{-s(n+p+m)T_s}-A_2e^{-s(n+2p+m)T_s}+A_1e^{-s(n+2p+m)T_s}-A_1e^{-s(2n+2p+m)T_s}$$

coupling the transfer function with a filter function to provide an augmented transfer function; and

acting upon an input signal according to the augmented transfer function to provide a control input signal.

16. (Original) The method of claim 15, wherein selecting one of the sets to provide a selected set is accomplished by:

determining a total time parameter for the selected set, the total time parameter corresponding to an amount of time needed to execute the corresponding transfer function; and

comparing the total time parameter of the selected set to determine that the selected set has a smallest total time parameter.

17. (Original) The method of claim 15, wherein selecting one of the sets to provide a selected set is accomplished by:

determining a sensitivity factor equation, the sensitivity factor equation being able to produce a sensitivity factor indicating an ability of the system to tolerate deviations;

determining a sensitivity factor for the selected set; and

comparing the sensitivity factor of the selected set to determine that the selected set has a smallest sensitivity factor.

18. (Original) The method of claim 17, wherein the sensitivity factor equation is

$$f = \sum_{\omega=\omega_l}^{\omega=\omega_h} abs\begin{pmatrix} A_1(1-\exp(-nT_s j\omega)) + A_2\exp(-(n+p)T_s j\omega)(1-\exp(-mT_s j\omega)) + \\ A_3\exp(-(n+2p+m)T_s j\omega)(1-\exp(-nT_s j\omega)) \end{pmatrix}$$

19. (Original) The method of claim 15, wherein the filter is an integrator.

20. (Original) The method of claim 15, wherein the filter is a first order filter.

21. (Original) The method of claim 15, wherein the filter is a sinusoidal filter.